CoreGRID Industrial Conference

SLA Management and Reputation in a Dynamic Virtual Organisation

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Outline

• TrustCoM basics → VO
• Virtual Organisations phases
• E-Learning story board
• Workflow : WS-CDL → BPEL
• Framework components
• Member/Supplier Selection, Scoring & Reputation
• SLA Setup
• SLA Operation
• SLA Violation
• Virtual Organisation Learning Operation
• Real business model.
The mission of the TrustCoM integrated project is to provide a trust and contract management framework enabling the definition and secure enactment of collaborative business processes within Virtual Organisations that are formed on-demand, self-managing and evolve dynamically, sharing computation, data, information and knowledge across enterprise boundaries, in order to:

- tackle collaborative projects that their participants could not undertake individually or
- to collectively offer services to customers that could not be provided by the individual enterprises.
Virtual Organisation phases

- Preparation
- Formation
- Operation
- Dissolution
- Evolution
- Reputation
- SLA
- Scoring

SLA Negotiation
Policies
A student wants to make use of the internet for learning courses according to its individual needs, covering not only the learning goal, but also the current knowledge of the user with respect to the topic.

In order to receive such a learning course, he contacts a “VO Learning Portal Service” that provides the capability of arranging a set of learning providers from a “Learning Enterprise Network” so as to provide the bespoke lessons.

Setting up a collaboration of learning resource providers tailored to the student’s respective needs.

This information implicitly defines the learning path details and as such the “workflow” guiding the learning providers.

A General Virtual Organisation Agreement (GVOA) is set up that legally binds the participants to the VO and its specific conditions & terms.
Learning path workflow to achieve certain competences

LR_1
- LC_1 (EPR)
- LT_1 (EPR)

LR_2
- LC_2 (EPR)
- LT_2 (EPR)

LR_3
- LC_3 (EPR)
- LT_3 (EPR)

LR_4
- LC_4 (EPR)
- LT_4 (EPR)

End Learning Path

LR_* Learning Resource fully qualified EPR.
LC_* Correspond to the Learning Course chosen from the Learning Path
LT_* Correspond to the Learning Test associated to the Learning Resource.

Replacement on the fly
Hi TrustCom!

Here you have the Learning Resources you have bought:

To see more details, click on the +Info icon.

- UML modelling with Rational Rose
  - UML modelling with Rational Rose
    - price: 30 €, language: English
  - price: 10 €, language: English

- Development Tools
  - Development Tools
    - price: 35 €, language: English

- Everything You Wanted to Know about Databases
  - Everything You Wanted to Know about Databases
    - price: 66 €, language: English, duration: 97h

For TRUSTCOM UNICAMANTE

- UML modelling with Rational Rose
  - price: 50 €, language: English, duration: 1h

For TRUSTCOM UNICAMANTE

- Programming in the New Knowledge Society
  - Programming in the New Knowledge Society
    - price: 10 €, language: English, duration: 0h
Overview of the different components

Running at Atos Linux
Oracle

Running at HLRS

Oracle Database
PEP 4 Server
LRProviderGateway
LRProvider

Running at IC
PolicyService

Running at BAE

STS-PP

Running at SICS
VO SLAManager
SLAManager
Accounter
SLAEvaluator
SLAPerformanceLog

Running at Atos Windows
.NET

SLAManager
SLAMonitor
MMStorage
DataBase MySQL

Virtual Organisation

SIR
NotificationBroker
Notification Proxy
NotPxyFactory
SIR

SLA Monitor Factory

PEP 4 Client
PortalProviderGateway
PDP
Distributed Deployment model

- HLRS .NET + Java
- IC Java
- SICS Java
- Atos Windows Browser
- Atos Windows .NET
- Atos Linux Oracle
- Atos Linux Java Axis2
- Virtual Organisation

Technologies:
- SOAP
- WS-Addressing
- WS-Security
- WS-Agreement
- MTOM
- XCAML
- SSL
1. The SLA Monitor provides the performance related status information *on schedule*
2. The Notification sub-system provides the information as an event to all subscribers
3. The status information is forwarded to the evaluator which compares status with agreed upon SLA
4. The evaluation result is pushed back to the VO as an event notification
5. The violation / fulfilment event is distributed to all subscribers
6. This information is then
   a) Evaluated by the Policies
   b) Converted into a reputation score
7. The computed score is forwarded to the (external) Reputation Manager to update the SP’s reputation
8. And is then evaluated by the VO Policy Service to identify potential actions
SLA & Reputation criteria

- **SLA measurement model**
  - Metrics: Response time
  - Monitor: Scheduled
  - Range: Which is the QoS to be fulfilled?
  - Policies: What are we going to do after a violation?

- **Performance measures (Response time)**
  - 1) Time to do the course (deadline) – user
  - 2) Time to provide the course (performance-RSP time)
  - 3) Result of the Test
  - 4) Number of repeats (by test)
  - 5) User satisfaction and questionnaire
  - 6) Student repeat use of eLearning Service (attention)

- **Selection Criteria - Measures for Provider Selection / Scoring**
  - Pass-over-fail: 70% pass versus fail of results
  - Repeat rate-over-courses: 50% repeats over a Window
  - User-satisfaction over the history of the service provider
  - Overtime-measure over the history of the service provider
  - Count of provisions over the history of the service provider
  - Price
  - New entrant measures? Undercutting the price
  - Recent changes
SLA & Notification Setup

1. Get an EPR from the factory

2. getInstance Noxy

3. getInstance + registry Broker

4. register to SLAStatusUpdate as producer

5. setSLA(SLA, Noxy EPR)

6. subscribe to SLAStatusUpdate as Consumer

7. Register as SLANotification as Producer

8. Subscribe to SLAViolation topic.

[1] getInstance

[2] getInstance

[3] getInstance + registry Broker

[4] register to SLAStatusUpdate as producer

[5] setSLA(SLA, Noxy EPR)

[6] subscribe to SLAStatusUpdate as Consumer

[7] Register as SLANotification as Producer

[8] Subscribe to SLAViolation topic.
Atos Linux
Oracle
VOLearning operation

Atos Linux
Java Axis2
Oracle Database
LRProviderGateway
PEP 4 Client
PDP
PortalProviderGateway
PEP 4 Server

Atos Windows
BackEnd

Learning Resource Providers

HLRS.NET
STS-LRP

BAE.NET
STS-PP

http http

Albert/Learner

http

to MMStorage and SLA subsystem

Atos Linux
Java Axis2

Atos Windows
BackEnd
SLA scenarios

1. The status is monitored and evaluated but does not raise a violation
2. The status triggers a violation, causing a decrease in the reputation
3. The violation decreases the reputation so much that reconfiguration is initiated
SLA Violation -> Expulsion

Diagram illustrating the process flow involving various service components and interactions such as SLA Evaluator, SLA Manager, Policy Svc, and Logging Service, with key steps including log notifications, policy service, audit logs, and service provider actions like replace Svc Provider, get EPR, SLA_ID, stop (SLA_ID), and stop (SLA_ID) for different components.
Business application
• Every time a violation is made, the price raises up.

• If so many times the violation is produced, an automatic replacement is needed.

• On the other hand if the fulfillment of the SLA is accomplished, then the price is decreased.
Deployment effort for introducing new providers

- Replacement a supplier on the fly
- Less Person effort
- SLA in place, monitored (framework)
- Trusted & secured framework
- Awareness of providing good provision to the weaker partner. (Learner)
• Security, no cost to become a new supplier.
• Within the implementation of this test bed, the providers have a fully functional platform, to just get in the TrustCoM framework, without doing major changed to their respectively previous legacy systems, allowing though to ensure a correct, secure, and reliable transmission of the courses throw the internet.
Thank you

Questions
SLA process with integration to Reputation, Scoring and Policy

- SLA Monitor
- SLA Eval
- Policy
- Rep
- Scoring
- System Log

Member – Metric, Value, Score

Metric DB | Values DB | Analytics | M-Scores
Integration Process Scenario 1:

1. Special events from SLA SubSys
2. Messages sent to Scoring Sys
3. Score computed and sent to Rep Sys
4. Reputation calculated and
5. VO member reputation updates
Principal Communication
2 - evolution

- Reputation Manager
- Reputation Evaluator
- Notification Broker
- Policy Service
- SLA Perf. Log
- SLA Evaluator
- VO Mgmt
- Audit Log
- Application Service
- Application Service
- Customer
Demo 1: simple access

Client App. invokes service with logical name

Convert logical name to EPR/URL

Encrypt message using client token

Forward message to actual endpoint

Decrypt message using client token

Invoke actual resource
Demo 2b: Reputation -> Reconfiguration

- Reputation Manager
  - Rep. Manager
  - Notification Proxy
  - local Policy Svc

- SLA Evaluator
  - SLA Evaluator
  - Notification Proxy

- SLA Performance Log
  - Log
  - Notification Proxy

- Policy Service
  - Policy Service
  - Notification Proxy
  - Logged message
  - Log
  - Message duplicate
  - Logging Notification (workaround)

- Logging Service
  - Audit Log
  - Notification Proxy

- Service Provider
  - SLA Monitor
  - NEC Antenna
  - PEP
  - STS

- Consumer
  - Client App.
  - PEP
  - SIR

- Decrypt message using client token
- Encrypt message using client token
- Decrypt message using client token
- Activate logging
- Message duplicate
Demo 3a: Violation -> Expulsion

- **SLA Perf Log**
  - Log
  - Notification Proxy

- **SLA Evaluator**
  - SLA Evaluator
  - SLA Manager
  - Notification Proxy
  - Stop (SLA_ID)

- **Policy Svc**
  - Policy Svc.
  - Notification Proxy

- **Logging Service**
  - Audit Log
  - Notification Proxy

- **Consumer**
  - STS
  - PEP
  - SIR
  - Delete EPR
  - Delete EPR? STS?

- **Service Provider**
  - NEC Antenna
  - PEP
  - STS
  - Notification Proxy

- **VO Manager**
  - VO Mgr
  - Membership Mgr
  - VO SLA Mgr
  - Stop (SLA_ID)

- **Replace Svc Provider**
  - Inform about replacement

- **Check Log**

- **Get EPR, SLA_ID**

- **Member-ship Mgr**

- **VO SLA Mgr**

- **Stop (SLA_ID)**
Demo 3b: Access during Evolution

Client App. invokes service with logical name

Convert logical name to EPR/URL

Failed: logical name unknown (display error)
Demo 3c: Expulsion -> Evolution (formation)

- **Consumer**
  - Client App.
  - PEP
  - SIR
  - Add EPR

- **Service Provider**
  - PEP
  - NEC
  - Register as producer

- **Policy Svc**
  - Policy Svc.
  - Notification Proxy

- **Logging Service**
  - Audit Log
  - Notification Proxy

- **VO Manager**
  - VO Mgr
  - Membership Mgr
  - VO Mgr

- **SLA Evaluator**
  - SLA Evaluator
  - SLA Manager
  - Notification Proxy

- **Config (SLA)**
  - Accept replacement

- **Config (SLA_ID)**
  - Optional: Pseudo-Instantiate

- **SLA Perf Log**
  - Log
  - Notification Proxy

- **Notification Proxy**
  - SLA Perf Log
  - Policy Svc
  - Logging Service

**Key Terms**
- **SLA Evaluator**: Evaluate SLA
- **Policy Svc**: Policy Service
- **Logging Service**: Log Service
- **VO Manager**: VO Manager
- **Membership Mgr**: Membership Manager
- **VO Mgr**: VO Manager
- **SLA Perf Log**: SLA Performance Log
- **Notification Proxy**: Notification Proxy
- **Config (SLA_ID)**: Configuration (SLA_ID)
- **Add EPR (Role Name)**: Add EPR (Role Name)
- **Get alternative EPR, SLA_ID**: Get alternative EPR, SLA_ID

**Steps**
1. Consumer
   - Add EPR
   - SIR
   - PEP

2. Service Provider
   - NEC
   - Register as producer

3. Policy Svc
   - Policy Svc.
   - Notification Proxy

4. Logging Service
   - Audit Log
   - Notification Proxy

5. SLA Evaluator
   - SLA Evaluator
   - SLA Manager
   - Notification Proxy

6. Configuration
   - Config (SLA)
   - Config (SLA_ID)

7. Optional
   - Pseudo-Instantiate
Demo 3d: Expulsion -> Evolution (start operation)
Demo 3e: access after evolution

- SLA Perf Log
  - Log
  - Notification Proxy

- SLA Evaluator
  - SLA Evaluator
  - SLA Manager
  - Notification Proxy

- Policy Svc
  - Policy Svc.
  - Notification Proxy

- Logging Service
  - Audit Log
  - Notification Proxy

- Consumer
  - STS
  - Client App.
  - PEP
  - SIR

- Service Provider (alt.)
  - STS
  - SLA Manager
  - PEP
  - EMF Calculation
  - Notification Proxy
  - SLA Monitor
  - Notification Proxy

- VO Manager
  - VO Mgr
  - Membership Mgr
  - VO SLA Mgr
New components (as opposed to last phase)

- SLA Evaluator
  - SLA Manager
  - SLA Evaluator
  - Notification Proxy
- Reputation Manager
  - Rep. Manager
  - Reputation Evaluator
  - local Policy Svc
  - Notification Proxy
- SLA Perf Log
  - Log
  - Notification Proxy
- Policy Svc
  - Policy Svc.
  - Notification Proxy
- Logging Service
  - Audit Log
  - Notification Proxy
- VO Manager
  - VO Mgr
  - Member-ship Mgr
  - VO SLA Mgr
- Consumer
  - STS
  - PEP
  - SIR
- Service Provider
  - NEC Antenna
  - Notification Proxy
  - PEP
- SLA Monitor
- STS
- SLA Manager
- Service Provider (alt.)
  - STS
  - SLA Manager
  - PEP
  - EMF Calculation
  - Notification Proxy
  - SLA Monitor
What’s real
What’s not there

Fake here means that these are not the components provided by the respective partners